MATHEMATICS STANDARD ARTICULATED BY GRADE LEVEL

GRADE 4

Strand 1: Number Sense and Operations

Every student should understand and use all concepts and skills from the previous grade levels. The standards are designed so that new learning builds on preceding skills and are needed to learn new skills. Communication, Problem-solving, Reasoning & Proof, Connections, and Representation are the process standards that are embedded throughout the teaching and learning of mathematical strands.

Concept 1: Number Sense
Understand and apply numbers, ways of representing numbers, the relationships among numbers and different number systems.

PO 1.   Read whole numbers in contextual situations.

PO 2.   Identify whole numbers in or out of order.

PO 3.   Write whole numbers in or out of order.

PO 4.   State place values for whole numbers (e.g., In the number 203,495 what is the value of the 2?).

PO 5.   Construct models to represent place value concepts for the one's, ten's, hundred's, and thousand's places.

PO 6.   Apply expanded notation to model place value (e.g., 203,495 = 200,000 + 3,000 + 400 + 90 + 5).

PO 7.   Compare two whole numbers.

PO 8.   Order three or more whole numbers.

PO 9.   Make models that represent mixed numbers.

PO 10. Identify symbols, words, or models that represent mixed numbers.

PO 11. Use mixed numbers in contextual situations.

PO 12. Compare two unit fractions (e.g., ½ to 1/5) or proper or mixed numbers with like denominators.

PO 13. Order three or more unit fractions or proper or improper fractions with like denominators.

PO 14. Use decimals in contextual situations.

PO 15. Compare two decimals.

PO 16. Order three or more decimals.

PO 17. Determine the equivalency among decimals, fractions, and percents (e.g., 49/100 = 0.49 = 49%).

PO 18. Identify all whole number factors and pairs of factors for a given whole number through 144.

PO 19. Determine multiples of a given whole number with products through 144.

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Concept 2: Numerical Operations
Understand and apply numerical operations and their relationship to one another.
PO 1.   Add whole numbers.
PO 2.   Subtract whole numbers.
PO 3.   Select the grade-level appropriate operation to solve word problems.
PO 4.   Solve word problems using grade-level appropriate operations and numbers.
PO 5.   Multiply multi-digit numbers by two-digit numbers.
PO 6.   Divide with one-digit divisors.
PO 7.   State multiplication and division facts through 12s.
PO 8.   Demonstrate the associative property of multiplication.
PO 9.   Apply grade-level appropriate properties to assist in computation.
PO 10. Apply the symbol: • and ( ) for multiplication, and $\leq$, $\geq$.
PO 11. Use grade-level appropriate mathematical terminology.
PO 12. Add or subtract fractions with like denominators, no regrouping.
PO 13. Simplify numerical expressions using the order of operations with grade-appropriate operations on number sets.

Concept 3: Estimation
Use estimation strategies reasonably and fluently.
PO 1.   Solve grade-level appropriate problems using estimation.
PO 2.   Use estimation to verify the reasonableness of a calculation (e.g., Is 3284 x 343 = 1200 reasonable?).
PO 3.   Estimate length and weight using both U.S. customary and metric units.
PO 4.   Estimate and measure for distance.

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Strand 2: Data Analysis, Probability, and Discrete Mathematics

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Concept 1: Data Analysis (Statistics)
Understand and apply data collection, organization and representation to analyze and sort data.
PO 1.   Formulate questions to collect data in contextual situations.
PO 2.   Construct a single-bar graph, line graph or two-set Venn diagram with appropriate labels and title from organized data.
PO 3.   Interpret graphical representations and data displays including single-bar graphs, circle graphs, two-set Venn diagrams, and line graphs that display continuous data.
PO 4.   Answer questions based on graphical representations and data displays including single-bar graphs, circle graphs, two-set Venn diagrams, and line graphs that display continuous data.
PO 5.   Identify the mode(s) of given data.
PO 6.   Formulate predictions from a given set of data.
PO 7.   Solve contextual problems using graphs, charts, and tables.

Concept 2: Probability
Understand and apply the basic concepts of probability.
PO 1.   Name the possible outcomes for a probability experiment.
PO 2.   Describe the probability of events as being more likely, less likely, equally likely, unlikely, certain, impossible, fair or unfair.
PO 3.   Predict the outcome of a grade-level appropriate probability experiment.
PO 4.   Record the data from performing a grade-level appropriate probability experiment.
PO 5.   Compare the outcome of an experiment to predictions made prior to performing the experiment.
PO 6.   Make predictions from the results of student-generated experiments using objects (e.g., coins, spinners, number cubes).
PO 7.   Compare the results of two repetitions of the same grade-level appropriate probability experiment.

Concept 3: Discrete Mathematics – Systematic Listing and Counting
Understand and demonstrate the systematic listing and counting of possible outcomes.
PO 1.   Find all possible combinations when one item is selected from each of two sets containing up to three objects (e.g., How many outfits can be made with 3 pants and 2 tee shirts?).

Concept 4: Vertex-Edge Graphs
Understand and apply vertex-edge graphs.
PO 1.   Color maps with the least number of colors so that no common edges share the same color (increased complexity throughout grade levels).

Strand 3: Patterns, Algebra, and Functions

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Concept 1: Patterns
Identify patterns and apply pattern recognition to reason mathematically.
PO 1.   Communicate a grade-level appropriate iterative pattern, using symbols or numbers.
PO 2.   Extend a grade-level appropriate iterative pattern.
PO 3.   Create grade-level appropriate iterative patterns.

Concept 2: Functions and Relationships
Describe and model functions and their relationships.
PO 1.   Describe the rule used in a simple grade-level appropriate function (e.g., T-chart, input/output model).

Concept 3: Algebraic Representations
Represent and analyze mathematical situations and structures using algebraic representations.
PO 1.   Evaluate expressions involving the four basic operations by substituting given whole numbers for the variable.
PO 2.   Use variables in contextual situations.
PO 3.   Solve one-step equations with one variable represented by a letter or symbol using multiplication of whole numbers (e.g., $12 = n \times 4$).

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Concept 4: Analysis of Change
Analyze change in a variable over time and in various contexts.

PO 1.   Identify the change in a variable over time (e.g., an object gets taller, colder, heavier).

PO 2.   Make simple predictions based on a variable (e.g., increase homework time as you progress through the grades).

Strand 4: Geometry and Measurement
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Concept 1: Geometric Properties
Analyze the attributes and properties of 2- and 3- dimensional shapes and develop mathematical arguments about their relationships.

PO 1.   Identify the properties of 2-dimensional figures using appropriate terminology.

PO 2.   Identify models or illustrations of prisms, pyramids, cones, cylinders, and spheres.

PO 3.   Draw points, lines, line segments (open or closed endpoints), rays, or angles.

PO 4.   Classify angles (e.g., right, acute, obtuse, straight).

PO 5.   Classify triangles as right, acute, or obtuse.

PO 6.   Identify congruent geometric shapes.

PO 7.   Identify similar shapes.

PO 8.   Draw a 2-dimensional shape that has line symmetry.

Concept 2: Transformation of Shapes
Apply spatial reasoning to create transformations and use symmetry to analyze mathematical situations.

PO 1.   Demonstrate translation using geometric figures.

PO 2.   Identify a tessellation.

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Concept 3: Coordinate Geometry
Specify and describe spatial relationships using coordinate geometry and other representational systems.
PO 1.   Name the coordinates of a point plotted in the first quadrant.

Concept 4: Measurement - Units of Measure   **- Geometric Objects**
Understand and apply appropriate units of measure, measurement techniques, and formulas to determine measurements.
PO 1.   Identify the appropriate measure of accuracy for the area of an object (e.g., sq. feet or sq. miles).
PO 2.   Compute elapsed time using a clock (e.g., hours and minutes since or until…) or a calendar (e.g., days, weeks, years since or until…).
PO 3.   Select an appropriate tool to use in a particular measurement situation.
PO 4.   Approximate measurements to the appropriate degree of accuracy.
PO 5.   Compare units of measure to determine *more* or *less* relationships including: • length - yards and miles, meters and kilometers, and   • weight - pounds and tons, grams and kilograms.
PO 6.   State equivalent relationships (e.g., 3 teaspoons = 1 tablespoon, 16 cups = 1 gallon, 2000 pounds = 1 ton).
PO 7.   Compare the weight of two objects using both U.S. customary and metric units.
PO 8.   Determine the perimeter of simple polygons (e.g., square, rectangle, triangle).
PO 9.   Determine the area of squares and rectangles.
PO 10. Differentiate between perimeter and area of quadrilaterals.

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Strand 5: Structure and Logic

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Concept 1: Algorithms and Algorithmic Thinking
Use reasoning to solve mathematical problems in contextual situations.
PO 1. Discriminate necessary information from unnecessary information in a given grade-level appropriate word problem.   PO 2. Develop an algorithm to calculate the perimeter of simple polygons.

Concept 2: Logic, Reasoning, Arguments, and Mathematical Proof
Evaluate situations, select problem-solving strategies, draw logical conclusions, develop and describe solutions and recognize their applications.
PO 1. Draw a conclusion from a Venn diagram.   PO 2. Identify simple valid arguments using *if…then* statements based on graphic organizers (e.g., 2-set Venn diagrams and pictures).